

Policy, Leadership, and Worker Empowerment

GUIDING PRINCIPLE #1: Line management is directly responsible for the protection of the public, the workers, and the environment.

OAK, LLNL, and UC senior management have displayed a commitment to protect workers, the public, and the environment. Safety policies and goals are documented, and initiatives are under way to improve ES&H programs and implement ISM. However, more effective leadership is required to translate management's expectations into implementing mechanisms, such as work planning and control processes, at the work activity level. Increased management field presence is necessary to improve safety performance and worker awareness and understanding of ISM.

DOE Policy and Leadership

OAK, in conjunction with DP and EM, has established appropriate safety policies and goals. For example, in late 1995, OAK developed an ES&H policy that contained top-level performance goals for contractor ES&H programs. DP and EM have actively participated in developing and implementing provisions of DOE Policy 450.4, *Safety Management System*, and the DOE Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 95-2, which addresses safety management. OAK has also been proactive in implementing DOE Policy 450.4.



OAK has increased its onsite presence at LLNL.

In recent years, OAK has taken many actions to strengthen its emphasis on safety

performance and provide better oversight of contractor ES&H activities. One of the most significant actions was greatly increasing the DOE onsite presence at LLNL (116 personnel as compared to about 25 in the early 1990s), including re-establishing and staffing the Livermore Site Office (LSO) to oversee LLNL infrastructure and institutional programs such as fire protection or emergency management. With the increased resources on site, OAK is better positioned to monitor LLNL activities. OAK has also strengthened its Facility Representative Program and reorganized to improve the use of ES&H resources.

OAK has provided leadership by clearly communicating the need to improve ES&H performance to LLNL and by working to ensure that LLNL maintained a focus on ES&H. OAK has entered into formal partnership agreements with both LLNL and UC to address a variety of issues including ES&H. In this partnership, OAK is working with LLNL to strengthen requirements management through the development of Work Smart standards. OAK also continues to work with UC to enhance their use of performance-based measures in the DOE/UC contract, which has incorporated performance-based measures since 1992. The new contract, which took effect on October 1, 1997, includes provisions relating to implementation of the DOE ISM initiative and a continued focus on translating ES&H expectations into performance measures and goals.



OAK has numerous ongoing initiatives to enhance safety management.

Although enhancements have been made in the past few years, OAK management recognizes that much remains to be accomplished. A recent (June 1997) OAK self-assessment identified a number of areas for

OAK'S GUIDING PRINCIPLES FOR PARTNERING

I. Expectation	Management to set the example (leadership) Partnering is an operating philosophy Working level relationships are the foundation Stewardship of public trust Clear expectations (what, not how) Common goals Mutual agreement on desired results Individual cannot do it alone
II. Behavior	Mutual trust/honesty Communication Recognize change is difficult Shared understanding and knowledge of process and obstacles Teamwork (Headquarters, field, contractors) Flexibility of approach
III. Outcome	Mutual success - Work products - Relationships Tolerance for failure and celebration of success Recognition that working-level relationships are the foundation Learn from successes and failures Reward any success (even within failure)

improvement within OAK. In recent months, OAK has taken a number of other steps to implement ISM and improve their oversight activities. These steps have included reconstitution of the OAK ES&H Committee with involvement by Associate Managers, creation of a supporting ES&H Working Group, documentation of safety roles and responsibilities, establishment of Operations Teams to improve ES&H oversight and increased facility presence by OAK managers, and development of an issues management system. These recent steps demonstrate management's understanding of the need to improve and a commitment to achieving these improvements. Although these recent initiatives are promising, most began in the August 1997 time frame and their effectiveness cannot yet be determined.

University of California and LLNL Policy and Leadership

UC has developed strategies, policies, and priorities for the three national laboratories under its direction. UC performs various activities, such as weekly conference calls and quarterly ES&H panel meetings, to maintain an awareness of laboratory safety. UC also works with LLNL and DOE on the development of Work Smart standards and contractual performance measures (in Appendix F) and participates on the annual self-assessment. These efforts reflect UC's increasing involvement in safety management and their commitment to the integration of safety into the management of LLNL operations.

LLNL has a set of documents that delineate top-level safety policies and expectations. These include the Environment, Safety, and Health Program at the LLNL (referred to locally as the Blue Book), the

LLNL Health and Safety Manual, and the Environmental Compliance Manual. LLNL's policies are further delineated in a series of sub-tier documents that include ES&H management plans, facility safety procedures, operational safety procedures, and discipline action plans (used for technical disciplines such as industrial hygiene).



The LLNL Site in Livermore, California



LLNL's top-level policies are clear and appropriate.

In general, LLNL's top-level policies (including senior management policy statements and the overall policies that provide general expectations, such as establishing a safe workplace and adopting ISM as an institutional framework for safety management) and goals (such as reduced injury rates) are clearly specified, appropriate, and reflect management's commitment to safety. As such, these top-level policies provide the workforce with a common set of expectations and help to focus the organization on safety. Top-level policies, however, provide only general guidance and do not, in themselves, provide sufficient detail to ensure that individuals within the organization will know what actions to take to achieve these goals. An effective safety management system must translate the top-level policies into more specific policies (such as policies on adherence to procedures) and then translate the specific policies into requirements and actions that ensure the policies are implemented throughout all levels of the organization.



Weaknesses in operational-level policies contribute to events and errors.

In many cases, LLNL's top-level policies have not been effectively delineated and translated into more specific direction and guidance that can be understood and implemented effectively. For example, LLNL does not have clear policies on work authorization or adherence to procedures. Further, in some cases policies are not consistently translated into effective procedures that specify controls and limits at the working level. The weaknesses in policies, including those relating to work control processes (for example, procedure use and adherence, work instructions, hazards controls, work authorization, and work supervision), have contributed to a number of reportable occurrences and errors, safety performance issues associated with the recent filter-shredder event, the deficiencies in criticality safety leading to the recent curtailment of operations in the plutonium facility, and other events and accidents.

In addition, important aspects of safety management have not been institutionalized or integrated into working-level processes. Such weaknesses are not limited to a single facility or organization but are evident across the site. Continued senior management attention and leadership are needed to obtain the full support and commitment of lower-tier managers, supervisors, and workers to translate top-level policies into working-level actions and to coordinate efforts that involve multiple LLNL organizations. These weaknesses, which are discussed in more detail in later sections of this report, include the following:

- LLNL managers and supervisors generally spend only very limited time in the field observing work and safety performance and promoting ISM. Walk-throughs need to focus more on observing and improving human performance and promoting ISM.
- Safety performance expectations have not been translated into all subcontracts issued by LLNL.
- Some of the contractual ES&H performance criteria (Appendix F) are not sufficiently challenging or specific to promote improved performance.

- Although some ISM training has been provided, additional training is necessary throughout the organization to achieve the desired level of performance.
- Management has not implemented effective systems for recording and tracking identified deficiencies related to human performance (such as procedural violations or unsafe work practices) so that they will have an accurate understanding of safety problems and trends.
- Identified deficiencies are not being systematically analyzed and trended to provide management with reliable information needed to make decisions related to training, resource allocation, and organizational performance assessments.



The LLNL Director and the OAK Manager have acknowledged the need for performance improvement.

The LLNL Director and the OAK Manager have acknowledged the need for performance improvement in ES&H and a change in the LLNL organizational safety culture. The LLNL Director and OAK Manager have made it clear that they expect LLNL operations to be carried out safely and that the current level of performance does not meet expectations. This message has been clearly communicated, and personnel at all levels of LLNL understand that improvements are needed.



LLNL has made significant progress in defining its approach to ISM.

LLNL senior management has demonstrated its leadership and commitment to safety through its support of and involvement in various safety-related efforts. LLNL submitted a formal description of the Integrated Safety Management System to DOE in late October 1997, and full implementation is scheduled for completion by the end of October 1998. In addition, LLNL was one of the first DOE organizations to integrate ES&H professionals into line program activities using an ES&H team matrix

support approach, which has been used for more than 35 years. LLNL has also emphasized the importance of ES&H by establishing the Associate Deputy Director for Operations position, to focus ES&H efforts, and the ES&H Working Group, to address crosscutting LLNL safety issues and to assist with safety policy development. The LLNL senior management commitment to ISM is also evident in the many special meetings, posters, handouts, and other means of top-down communication. LLNL has initiated benchmarking of safety performance against private sector companies in an effort to improve safety and establish LLNL safety practices that are similar to best industry practices.



LLNL has many programs in place that can be strengthened.

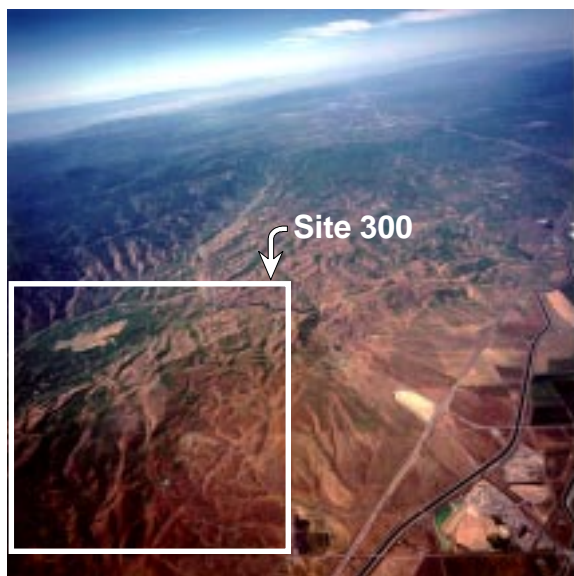
Many of the management tools essential to achieving the implementation of ISM and a change in safety culture are already in place at LLNL but need expansion or strengthening to improve safety management and leadership.

- LLNL has taken steps to increase worker involvement in the development of safety initiatives, such as the Executive Safety Committee in Plant Engineering. Such efforts should be continued and extended to increase employee ownership and commitment to ES&H and ISM.
- A number of self-assessment and ES&H oversight initiatives are under way at LLNL that have the potential to provide the feedback necessary to achieve continuous improvement in safety performance. These efforts could also contribute more to ES&H performance through a stronger focus on human performance and increased assessment preparation, structure, follow-up, and trending of results.
- LLNL has established a comprehensive Health and Safety Manual that reflects the requirements of DOE orders and management safety policies. An LLNL policy and process needs to be established to ensure the appropriate use of and adherence to these procedures in conducting potentially hazardous site activities.

Although LLNL has a number of promising initiatives in place, LLNL management does not have a program that effectively addresses work control processes on a sitewide basis. Establishment of a common sitewide process or mechanisms to control all work activities is necessary to effectively translate and integrate senior management safety policies and expectations in the field. Such a process or mechanism should ensure that the five core functions of ISM (defining the work, analyzing the hazards, controlling the hazards, working within the controls, and providing feedback for improvement) are integrated appropriately into every work activity, including activities conducted at low hazard facilities, work performed by LLNL personnel and subcontractors, and all phases of facility operations (including operations, maintenance, research, and decommissioning). Such a process or mechanism also needs to promote effective tailoring of work controls to the level of hazard. Although ISM provides the framework for the needed improvements in work control processes, additional management attention is needed to ensure that work controls are addressed on a sitewide basis.

Stakeholder and Worker Involvement

LLNL and OAK have been proactive in keeping concerned citizens, workers, and stakeholders informed and in involving them in ES&H decisions. OAK distributes a quarterly newsletter, *News You Can Use*, to about 1,600 stakeholders. OAK and



LLNL's Site 300

LLNL meet periodically with citizen and stakeholder groups such as the National Ignition Facility Environmental Safety and Health Working Group, the Community Working Group, and the Technical Advisory Group. Stakeholder comments have been encouraged and considered in ES&H decisions.



A high-speed photograph of a non-nuclear explosive test at LLNL's Site 300

OAK is required to have an employee concerns program pursuant to DOE Order 5480.29, *Employee Concerns Management System*, to provide a mechanism for employees to raise concerns, including safety-related issues. An informal program was established but the program was used infrequently, responsibilities were not clearly assigned, instructions were not issued, the "hotline" phone number was not consistently posted, and a test call to the hotline resulted in no response. DOE and LLNL employees are aware that the program exists, but the program has seldom been used. Effective implementation and maintenance of this program is needed to provide the required additional avenue for reporting concerns.



LLNL has implemented a stop-work policy.

LLNL has taken a number of important steps to improve safety through the empowerment of workers. For example, workers have been encouraged to stop jobs that they believe to be unsafe, and there are a number of instances where they have done so. Management has encouraged workers to raise safety concerns, and most workers believe that management has been receptive and willing to address these concerns. Processes have been established by LLNL for reporting and addressing employee concerns. Worker ownership and

commitment have been enhanced in some areas by involving workers in the development of improvement initiatives. For example, an Executive Safety Committee has been established in Plant Engineering to involve workers in addressing safety issues. Committee members are working level craft personnel, and management has provided them with the time, resources, and encouragement to identify and resolve safety problems.

Summary

OAK, UC, and LLNL senior management have established appropriate safety policies and goals, recognize the need for improvement, and are working together to more effectively integrate ES&H into Laboratory activities. The commitment to safety by senior managers and the top-down approach to achieving organizational change that is evident at LLNL is essential but not sufficient to achieve a change of culture and full implementation of ISM. Sustained improvement in safety performance will require managers, supervisors, and workers¹ to also embrace ISM and become more active in developing mechanisms to implement enhancements at the working level. The LLNL staff and subcontractors do not yet have a good understanding of the specific steps to be taken to improve performance, because management has not yet effectively translated its expectations into implementing mechanisms such as work controls, ES&H requirements in subcontracts, supervisory oversight, performance measure criteria, and training. Lower level managers and supervisors, in most cases, are not yet providing the essential increased field presence and needed leadership, including direct observation, coaching, training, and promotion of the ISM concept and timely reinforcement and feedback.

Clear Roles, Responsibilities, and Accountability

GUIDING PRINCIPLE #2: Clear lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels within the department and its contractors.

¹ As used in this report, “worker” refers to non-supervisory positions at LLNL, including scientists, researchers, ES&H professionals, crafts and maintenance personnel, and administrative staff.

DOE and LLNL have clearly delineated roles and responsibilities for ES&H that provide a foundation for effectively integrating safety into sitewide operations. DOE and LLNL have mechanisms to hold organizations and individuals accountable for performance, although they need strengthening in certain areas. LLNL has effectively used a matrix management approach to support their diverse and changing ES&H needs.

DOE Headquarters

Historically, confusion over roles and responsibilities and the differing and sometimes conflicting direction has plagued multi-program-sponsored Laboratories and has been a continuing source of frustration to DOE field management. DOE Headquarters organizations have acknowledged the need to clarify organizational roles, responsibilities, authorities, and accountabilities. Consistent with DOE Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 95-2, which deals with safety management, and DOE Policy 450.4, *Safety Management System*, DOE Headquarters organizations (including DP and EM) are documenting their organizational roles within their respective Functions, Responsibilities, and Authorities Manuals (FRAM). For example, the EM FRAM now specifically includes provisions for “coordinating its direction to multiple program office sites to ensure consistency in requirements, compatibility of programs and activities, and efficiency in the use of resources to satisfy programmatic expectations” and resolving “conflicting direction to the field...before it is issued.” Continued attention is needed to ensure that the DOE Headquarters’ evolving responsibilities are clearly understood, accepted, and effectively implemented and that direction to the field is effectively coordinated.



Delegation of Safety Analysis Report approval to the field has streamlined the review process.

In recent years, the responsible Headquarters program offices—DP and EM—have been increasingly empowering OAK through the delegation of various functions. For example, DP delegated to OAK responsibility for approving Safety

Analysis Reports. This delegation of approval authority greatly streamlined the review and approval of the Building 332 Safety Analysis Report. DOE Headquarters (DP and EM) has appropriately retained responsibility in areas such as funding programs and infrastructure and ensuring the implementation of commitments to the Defense Nuclear Facilities Safety Board. While DP and OAK are coordinating their respective responsibilities and authorities in accordance with DOE's strategic realignment, DP has continued to provide technical support to OAK on an "as needed" basis. For example, DP's Office of Technical and Environmental Support provided assistance to OAK in a review of criticality safety at LLNL.

DOE Oakland Operations Office



Roles and responsibilities for OAK organizations and individuals are clearly documented.

OAK has recently established an Operations Office FRAM to define organizational and individual roles and responsibilities related to the management and oversight of LLNL operations. OAK's FRAM is consistent with DOE's strategic realignment and Headquarters' empowerment of the field. Numerous supporting documents have been developed to complement the FRAM and further define responsibilities. OAK has recently strengthened its ability to oversee ES&H by establishing a matrix management approach within the OAK Environment, Safety and Health Division (ESHD) to provide subject matter expert support to LSO and OAK program managers.



OAK ES&H subject matter experts are not being used effectively to support line managers.

The OAK ESHD's primary role is to provide support to the Associate Managers and LSO Manager and participate in the annual review of LLNL. However, most personnel from ESHD, either resident at OAK or currently providing matrix support to LSO, spend limited time in the facilities and are not being used effectively to support the line managers and

improve ES&H performance. The subject matter expertise of ESHD resources needs to be better utilized by increasing field presence and oversight involvement at LLNL beyond the two-week OAK annual site review. The recent establishment of OAK Operations Teams is a promising initiative for addressing this weakness, as these teams provide a mechanism for increasing involvement by ESHD personnel in field operations.

While the OAK Manager has overall responsibility for site operations, as shown on Figure 4, various OAK organizations are responsible for particular aspects of ES&H at LLNL. The LSO Manager is responsible for site infrastructure and institutional ES&H programs, such as fire protection, and for various institutional buildings (buildings, such as the fire department buildings and various office buildings, that are not used for particular programs). The Associate Managers are responsible for the implementation of the program mission and related ES&H. Although only recently documented (July 1997), these organizational responsibilities are clearly defined, and there is frequent communication and coordination between the LSO Manager and the Associate Managers. A planned OAK reorganization will create an Associate Manager for the LLNL site; this position will incorporate the current functions of the Associate Manager for National Security and LSO and thus will merge institutional and programmatic ES&H functions under one Associate Manager.

OAK uses position descriptions to delineate individual accountability for safety performance. Individual ES&H performance for line managers and staff is recognized through evaluations that include one or more criteria for evaluating safety performance. However, these criteria are evaluated on a pass/fail basis and thus provide limited feedback for correlating ES&H performance to performance evaluation ratings. The OAK Employee Recognition Policy and "spot awards" (which generally consist of time off with pay or small financial rewards for notable achievements or actions) are two methods used to reward employees for exemplary safety performance.

LLNL



LLNL has used its matrix management approach effectively to apply ES&H resources to projects.

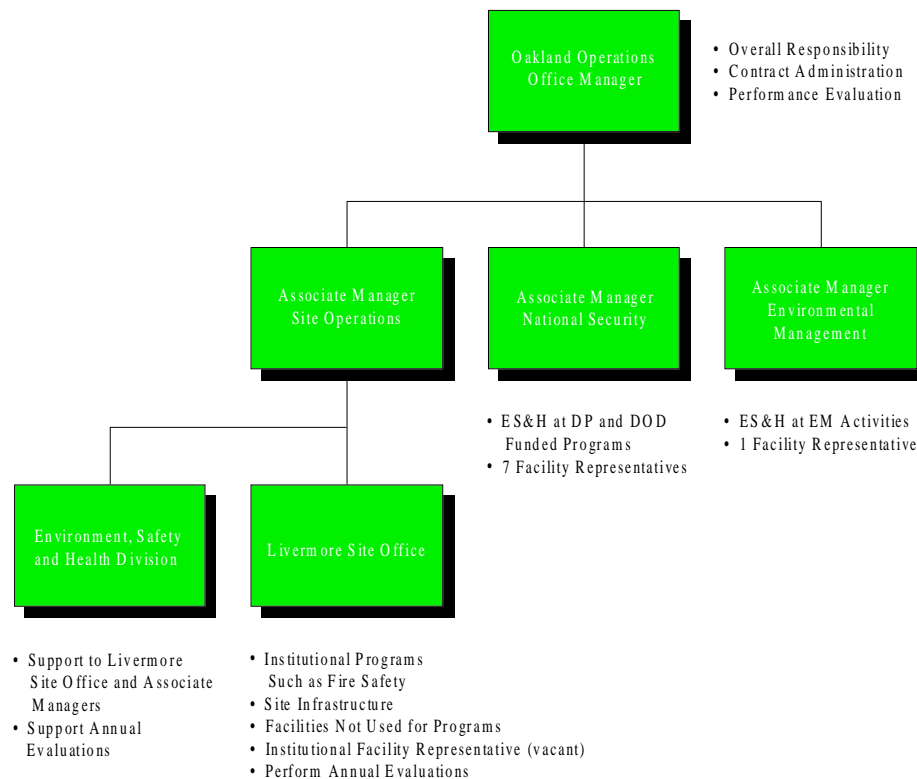


Figure 4. Oakland Operations Office Roles and Responsibilities

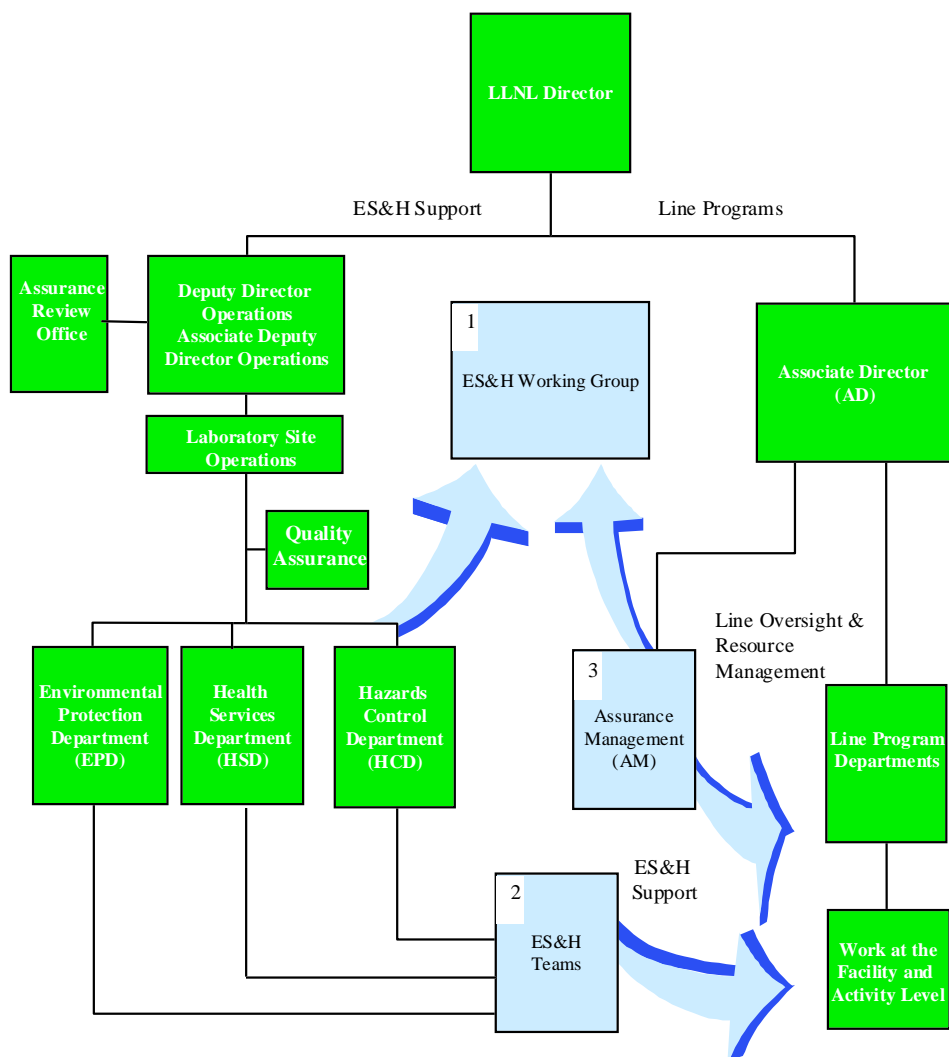
LLNL has a mature multi-tiered matrix management system (Figure 5) that is being used to apply available staff and experience efficiently, to quickly assemble multi-disciplined teams to support ES&H needs and emerging projects, to provide diverse experience and career paths for employees, and to effectively apply limited resources to the changing needs of individual projects or facilities. In addition, the matrix management approach is being applied to the ES&H teams, which provide technical support to the line program managers and also perform in a line management oversight role. As implemented, the LLNL matrix management system is effectively supporting the complex and the diverse activities and hazards associated with the LLNL mission.

Because of the inherent complexities associated with managing a large matrixed organization, clear

delineation of roles, responsibilities, and authorities is particularly important. LLNL has clearly defined roles and responsibilities in *The Environment, Safety, and Health Program at the LLNL* (commonly referred to as the “Blue Book”) and LLNL’s *Health and Safety Manual*. A comprehensive series of implementing documents further delineates roles, responsibilities, and authorities, including:

- ES&H Management Plans
- Facility Safety Procedures
- Operational Safety Procedures
- Discipline Action Plans

In addition, Memoranda of Understanding are used by LLNL management to further clarify roles, responsibilities, and authorities and to enhance



1. The Assurance Managers and the managers of HCD, EPD, HSD, and the Quality Assurance Support Office constitute the ES&H Working Group. This Group provides sitewide ES&H support, focusing on ES&H issues, guidance, and policy development.
2. ES&H Teams provide support to line managers to implement ES&H requirements at the facilities. They also perform an independent surveillance function. Four multi-disciplinary ES&H Teams, consisting of subject matter experts from HCD, HSD, and EPD, have been established under the direction of HCD. These four teams provide support to the various Directorates at LLNL.
3. Each LLNL Associate Director has an Assurance Manager. This individual is responsible for performing oversight of ES&H performance for the Associate Director, interfacing with the ES&H Team Leaders, and ensuring that operations within their Directorate are receiving an appropriate level of support.

Figure 5. Key Features of LLNL's Matrix Management Approach to ES&H Support

coordination between various organizations involved in site activities, projects, and ES&H. Although LLNL documents are generally effective in identifying roles, responsibilities, and authorities within the LLNL matrix organization, there are specific instances in which additional clarification and control is warranted.



Roles and responsibilities for controlling some types of work, such as maintenance, are not clearly established and communicated.

Some types of work activities, including maintenance, temporary modifications, and service type work, sometimes take place in a facility without the authorization or cognizance of responsible facility management. For example, holes were drilled in safety-significant equipment (glove boxes) in Building 332 without prior approval of the Facility Manager and in direct violation of the facility safety procedure. LLNL documents generally indicate that the LLNL Facility Managers are responsible for ensuring the safety of activities and work within their facilities, and thus they should have systems in place to ensure that they are cognizant of such work and have established and communicated controls. However, Facility Managers interviewed indicated varying degrees of understanding of their duties. For example, some Facility Managers indicated that they were not responsible for activities performed by maintenance groups while others indicated they were. These inconsistencies in understanding responsibilities resulted in inconsistent approaches to work and considerable variation in effectiveness from facility to facility.

Systems for holding personnel accountable are in place and implemented but need strengthening in some areas. LLNL has various methods to hold individuals accountable for ES&H performance. Top-level LLNL managers (Associate Director and above) are held accountable directly to the Contract Appendix F ES&H performance criteria, which are also used to address LLNL's organizational performance. These criteria account for 10 percent of the score used to determine their annual salary merit increases. Lower-tier LLNL managers and personnel with primary ES&H responsibilities, such as ES&H team leaders, also have specific ES&H performance criteria in their annual appraisals; in this manner, ES&H performance and events can

affect their salary. For non-management personnel, ES&H performance is included as an appraisal element in some cases but is not a prominent element for most workers. LLNL management plans to increase accountability for ES&H performance.

Individual organizations within LLNL have recognized and rewarded exceptional ES&H performance through various programs, such as the Demonstrated Implementation of ES&H Award in Chemistry and Materials and the "Red Pig" Award for Waste Minimization in Defense and Nuclear Technologies. In addition, the LLNL Directors Award was recently given to Plant Engineering employees for taking ownership of and implementing (without management involvement) the Executive Safety Committee that has helped advance the worker safety culture at the site. Traditionally, the LLNL Director's Awards are given quarterly for scientific and technological achievements; giving the Director's Award for excellence related to site infrastructure and worker safety reflects LLNL management's increased emphasis on cultural change and the importance of greater safety consciousness within the workforce. Although actions to reward performance have been taken by individual department managers, these programs often have not been institutionalized and are not consistent across organizations.

One issue that needs to be addressed is the perception among many LLNL employees that management is not holding individuals accountable for safety performance. Interviews with workers, supervisors, and lower level managers indicated that there was a widely held belief that no actions were taken by management against individuals who were responsible for safety violations or events. In fact, there were a number of cases in which management took significant actions, such as assigning low ratings in performance evaluations, barring subcontractors from the site, and issuing formal reprimands. Although it is appropriate that sanctions taken against individuals are held in confidence, it is important that LLNL management communicate to the site population that deficient ES&H performance can and does result in sanctions and that individuals are being held accountable for ES&H performance. It is important that rewards and sanctions be meaningful, accurately reflect the actions being addressed, and be exercised with reasonableness and discretion to promote a safety-conscious culture. It is also important to ensure that discipline is not used in a way that discourages timely reporting of

problems or that penalizes individuals when there are other root causes for deficiencies such as inadequate procedures, faulty work instructions, or inadequate training.



The use of ES&H contract performance measures has had a positive impact on environmental performance.

The “Partnership for Performance” agreement between DOE and UC emphasizes a commitment to an effective safety program based on clearly communicated standards of performance and associated measures. Performance criteria are contained in Appendix F of the contract and are achieving an increased level of expectations for LLNL ES&H performance each year. There are indications that these contractual ES&H performance measures are having a positive impact, particularly in environmental performance. For example, over the 1994-1996 period environmental findings and violations were reduced from 52 to 0 and environmental releases were reduced by 58 percent.



An environmental surveillance air-monitoring station

LLNL is attempting to strengthen and improve subcontractor accountability for onsite ES&H performance. For example, the construction contract for the National Ignition Facility contains ES&H performance requirements and requires an ES&H plan. Other examples of LLNL management’s efforts to improve subcontractor safety performance include:

- Pre-screening and qualification of subcontractors based on safety record
- Inclusion of ES&H requirements
- Pre-work ES&H briefings by LLNL
- LLNL authority to discharge individuals or cancel subcontractors



A well for monitoring groundwater contaminants

While these initiatives have demonstrated a level of success in improving subcontractor accountability, subcontractors associated with small construction and site support services, including maintenance and operations, are still in need of improvement.

Summary

OAK has clearly identified and communicated roles, responsibilities, and authorities through the OAK FRAM and implementing documents. DOE Headquarters also has clarified roles, responsibilities, and authorities through the DOE FRAM, delegation of many roles and responsibilities to the field, and initiatives designed to improve the coordination of Program Offices’ direction prior to giving it to multi-program laboratories such as LLNL. LLNL has clearly documented roles and responsibilities through the Health and Safety Manual and numerous Memoranda of Understanding in the matrix organization.

OAK, UC, and LLNL have worked toward increased accountability for LLNL ES&H performance by establishing a performance-based contract, using ES&H performance measures, and basing 10 percent of the annual LLNL appraisal on

ES&H performance. However, some of the performance measures could be more specific and challenging. Accountability for OAK and LLNL managers' ES&H performance is achieved through position descriptions and the annual appraisal process. For senior LLNL managers, appraisals are tied directly to the contract performance metrics. Accountability for LLNL personnel, particularly for adherence to procedures and responsibility for events and accidents, needs additional improvement.

Balanced Priorities

GUIDING PRINCIPLE #3: Resources shall be effectively allocated to address safety, programmatic, and operational considerations. Protecting the public, the workers, and the environment shall be a priority whenever activities are planned and performed.



OAK and LLNL have demonstrated their commitment to ensuring that ES&H has sufficient resources and priority.

OAK and LLNL have demonstrated strong support for ensuring that safe site operations and maintenance of facilities and site infrastructure are a priority at LLNL. Organizational changes, such as the establishment of the Associate Deputy Director for Operations and Institutional Facility Manager positions, reflect the LLNL Director's efforts to increase the visibility of ES&H and support for

infrastructure, such as groundwater protection, maintenance, fire protection, utilities, and facility and system upgrades. Recent actions by OAK and LLNL management, such as incorporating the UC/LLNL commitment to implement an effective Integrated Safety Management System into the new DOE/UC contract and the extended curtailment of Building 332 facility operations because of criticality safety concerns while the facility was in the midst of a major mission activity, demonstrated senior management commitment to ensuring that ES&H receives appropriate priority at LLNL.

DOE Headquarters and Oakland Operations Office

As a DOE multi-program laboratory, LLNL's program funding is allocated according to the programmatic needs of several Headquarters offices, primarily DP, EM, NN, and ER. DP has historically provided the largest portion of LLNL funding, contributing about 50 percent of the total LLNL funding in 1997. DP provides programmatic direction and funding for stockpile stewardship and management and, as the site landlord, is responsible for all LLNL facilities and infrastructure needs throughout the site. Within DP, the DP Office of Research, Development, and Testing Facilities (DP-13) has primary responsibility for LLNL landlord activities. This office has been effective in its role of ensuring that mission requirements and LLNL infrastructure upgrades and maintenance priorities are appropriately considered in the Headquarters budget process.



Regulators and stakeholders are actively involved in establishing priorities and commitments for environmental management activities.

For activities funded by EM (which contributes about 7 percent of the total LLNL budget), the *Accelerating Cleanup: Focus on 2006* provides the basis for LLNL's ES&H direct funding budget associated with waste management and environmental restoration programs. Risk scores, prepared by LLNL in cooperation with OAK project managers, are based on



The Nova laser at LLNL

judgments about worker and public safety, environmental protection, compliance with regulatory requirements, and impact on mission objectives. For example, development of risk scores and setting priorities and commitments for environmental restoration activities are closely coordinated between OAK, LLNL, and stakeholders (state and federal regulators, public interest groups) and are documented in the Federal Facility Agreement and associated implementation milestone commitments. In accordance with the milestone commitments, EM, OAK, and LLNL have identified activities and funding levels. State and federal regulators have generally been satisfied with LLNL's progress to date, although they have concerns about delays and ongoing and proposed budget reductions that may impact LLNL's ability to meet future commitments. In order to ensure that established cleanup schedules are met, additional attention is needed at DOE Headquarters, OAK, and LLNL to determine whether the planned activities can be effectively accomplished at the reduced funding levels and/or whether additional delays in planned activities are acceptable.



OAK has been actively involved in prioritizing line items, projects, and resources at LLNL.

OAK managers and staff have been actively involved with LLNL to ensure an appropriate balance between mission objectives and prioritize proposed line items and general plant projects at the site. OAK uses a multi-disciplined review team approach to prioritization, which includes representatives from the line program, budget, ES&H, and the responsible Facility Representative(s). OAK and LLNL use the DOE Capital Assets Management Process prioritization process in the review and evaluation of LLNL project and funding priorities. Feedback from OAK recently resulted in increasing the LLNL priority that had been assigned to the plutonium facility fire protection system upgrades and challenging the level of priority assigned to other plutonium facility upgrades identified in the LLNL Line Item Five-Year Plan.

Recognizing a need to strengthen OAK line management's ability to make informed decisions about resource allocations, the OAK ES&H Committee is being revitalized to provide a framework and forum to evaluate the effectiveness of decision-

making processes for addressing OAK-wide ES&H priorities and resource needs. The allocation of matrixed resources from the OAK ESHD to support OAK line managers at the LLNL site is made by the OAK ESHD Director in consultation with the OAK line managers (site managers and program division directors). Currently, this process is informal, and individual staff are typically given general direction to support a particular site or program. In the future, the OAK ESHD plans to develop an annual ES&H resource allocation plan, which will be reviewed and approved by the OAK ES&H Committee. As discussed previously in the Clear Roles and Responsibilities section, better utilization and integration of OAK ESHD staff are needed to provide more timely technical support to OAK line managers at LLNL.

LLNL

The allocation of funding for institutional (sitewide support) ES&H activities and needs is prioritized in accordance with the LLNL Strategic Plan and with active involvement by LLNL senior management. The LLNL Site Operations Office provides most of the ES&H support to program activities and develops detailed work breakdown structures that are then prioritized using a risk-based prioritization process. Three funding mechanisms for ES&H services are used:

- **Institutional ES&H Programs.** Portions of the Hazards Control Department, Environmental Protection Department, Health Services Department, and institutionally managed functions (emergency preparedness, fire department, etc.) are paid for by indirect funds.
- **Facility Maintenance.** All facilities (building or areas) are assigned to an Associate Director who is designated as the Facility Associate Director. Facility operating and maintaining costs, such as plant engineering support for maintenance, is passed on to the users within the facility via a "tax" based on square footage (occupied space) of the building.
- **Direct Program Support.** ES&H Teams, which provide professional technical expertise, are paid for by the programs through direct funding. Funding levels are based on historical

levels and projected programmatic activities, as negotiated by the facility manager and ES&H team leader.



LLNL senior managers are actively involved in establishing ES&H priorities.

LLNL senior managers are providing important and constructive direction to balancing mission and ES&H priorities. For example, the LLNL Director recently increased the priority assigned to implementation of the Work Smart standard process during his review and approval of the institutional overhead budget for the site. In addition, the Associate Director for National Security, who is responsible for ensuring an appropriate balance of priorities across DP-related programmatic missions and landlord responsibilities, has been effective in assuring site infrastructure needs are being addressed in the LLNL Five-Year Plan. Five of the top 10 LLNL line item projects for fiscal years 1999-2003 are targeted for site and facility infrastructure upgrades.

LLNL ES&H and facility needs are being given appropriate priority in the competition for direct funding and resources. For example, LLNL facility safety-related equipment and systems are maintained commensurate with their importance to safety. Key drivers for direct ES&H funding needs are determined using guidance from DOE, including strategic goals and objectives reflected in various planning documents. For example, planning documents such as the *DOE Stockpile Stewardship and Management Program* (the Green Book), *DOE Nonproliferation Strategic Plan*, and Department of Defense Work for Others Program, are used to establish ES&H needs and priorities associated with DP-related activities.

The preservation of existing facilities, both those in operation and those that do not currently have a program mission, through effective maintenance, testing, and necessary upgrades, is an important safety-related activity. LLNL management, with support from OAK and DP-13, has been aggressive and one of the leaders in the DOE complex in the development of integrated approaches and tools to help management plan and prioritize direct funding needs and major projects and capital improvements. Notable examples include:



The Beamlet laser at LLNL, which is a test bed for the National Ignition Facility

- The LLNL Comprehensive Site Plan, which documents the integrated efforts of capital asset management, prioritization, condition assessment surveys, and projection of facility requirements for the next 20 years. Updates to this plan are coordinated with LLNL strategic planning and with stakeholders and the community through scheduled working meetings.
- LLNL management uses the Facility Assessment and Ranking System as a planning tool to provide a baseline measure on the material condition of each facility and identify facilities in need of attention. Senior management effectively uses this tool, in conjunction with program area plans, to make informed decisions on facility disposition, allocation of resources for facility maintenance and upgrades, and reinvestment in facilities.
- Policies, procedures, and processes have been established to support the effective safe shutdown, surveillance, maintenance, and disposition of excess facilities such as Buildings 222 and 227.
- Management systems have been established to ensure that facilities being reassigned or removed from mothball status provide a “full disclosure” of existing facility conditions to potential programs owners/users (fire safety, structural condition, and maintenance backlog).



LLNL's processes for allocating ES&H resources for some activities, such as maintenance, are not well-defined or understood.

Although the essential elements of an LLNL ES&H resource allocation process are established, improvements in processes that identify, communicate, and control hazards at the work activity level are needed to effectively balance ES&H needs with mission-driven work. LLNL's management of ES&H resources is most effectively applied to large projects and those work activities that have well-defined and established mechanisms for triggering the involvement of ES&H Teams. Other work activities, such as maintenance, temporary modifications, and some support services, often do not receive an appropriate level of ES&H attention, because work control mechanisms for these activities are either poorly defined or not well understood by line managers. In addition, the hazard classification of a facility is sometimes being inappropriately used as the dominant factor in ES&H resource allocation decision-making. Resource allocations that are based solely on the hazard classification of the facility do not consistently place proper emphasis on worker safety considerations. Facility hazard classifications are derived from postulated offsite population exposures resulting from potential accidents and thus do not always address hazards to workers from routine work activities.

Summary

DP, EM, OAK, UC, and LLNL have demonstrated an effective balance between mission-related activities and needs, and ES&H. DP and OAK have demonstrated strong support for the LLNL ES&H infrastructure, including maintenance and necessary upgrades to safety systems and equipment and the upkeep and disposition of excess facilities. OAK and LLNL use a multi-disciplined team approach to prioritization and, at times, OAK has increased LLNL priority determinations, such as the upgrade of fire protection systems at the Plutonium Facility. LLNL management uses a number of DOE tools to effectively prioritize activities and resources. The LLNL ES&H priorities were recently demonstrated through a voluntary extended stand-down of operations in the Plutonium Facility because of criticality safety concerns. This

action was taken by LLNL management in the midst of a significant mission and accompanying schedule milestones at the facility. LLNL has also demonstrated their ES&H priorities through an exceptional program for the safe upkeep, transition, disposition, and reuse of excess laboratory facilities, and this program could serve as a benchmark for other DOE sites. Establishing a common work control process rather than relying heavily on individual workers' knowledge and expertise is needed to further strengthen management's ability to effectively allocate resources and balance priorities.



Container storage in Area 514

Competence Commensurate with Responsibility

GUIDING PRINCIPLE #4: Personnel shall possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.

DOE and LLNL managers and staff demonstrate a high degree of technical competence and a good understanding of programs and facilities. With the exception of a few technical positions, OAK and LLNL have sufficient personnel with appropriate technical expertise.

DOE Headquarters

DOE Headquarters elements responsible for supporting LLNL activities have sufficient numbers of staff that focus on LLNL. Currently, there are three technical staff in DP's Office of Research, Development, and Testing Facilities (DP-13) who have responsibility for LLNL-related activities. DP-13 relies on support, on an as-needed basis, from technical specialists within DP's Office of Technical

and Environmental Support (part of DOE's Core Technical Group) for activities such as Safety Analysis Report reviews. The personnel in DP have extensive technical knowledge and a good understanding of the programs that DP directs and monitors. EM also has a small number of Headquarters technical personnel who provide support to OAK when needed.



DP and EM technical personnel are not on schedule to meet deadlines for meeting technical qualification requirements.

DP is complying with requirements of the DOE Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 93-3 (which establishes the Technical Qualification Program) and have established appropriate qualification standards. However, very few of the DP-13 personnel in the Technical Qualification Program are on schedule to complete their qualifications by the May 1998 (technical personnel) and May 1999 (Senior Technical Safety Managers) deadlines. For the past year, EM has placed a hold on completion of the Technical Qualification Program to address bargaining unit concerns with the program. This delay will make it even more difficult for EM's Technical Qualification Program participants to complete their requirements in time to meet the May 1998 deadline.

Oakland Operations Office

OAK and LSO managers demonstrate a high degree of technical competence and a good understanding of LLNL programs and ISM. OAK's senior managers have actively supported OAK efforts to enhance its capability to direct and assess contractor activities, including deployment of personnel to the site and staffing the ESHD. More recently, OAK senior managers have supported ongoing OAK initiatives to better deploy ES&H subject matter experts to the LLNL site to support the Facility Representatives. In addition, the OAK Manager is personally involved in staff training and qualification programs and is supporting the OAK effort to develop an employee skill data base, which is intended to provide more flexibility in shifting experienced resources between various activities.

OAK currently has 362 staff, approximately one-third (116) of whom are assigned to the site. Most of the OAK personnel assigned to the LLNL site report to the Associate Managers for National Security or Environmental Management. The significant increase in OAK personnel assigned to the site over the past few years has provided more DOE expertise and oversight at the site where it is most needed.

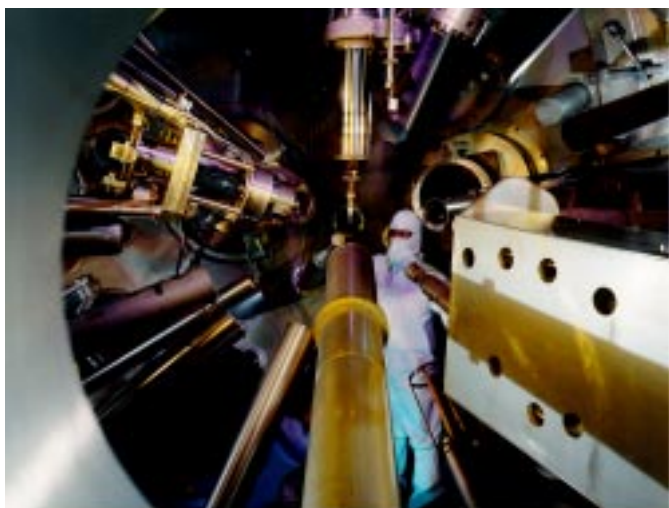
OAK has sufficient personnel with appropriate technical backgrounds to perform its mission. Four technical positions that are important to the office mission, however, remain unfulfilled: a risk-assessment engineer, subject matter experts in nuclear explosives safety and explosives safety, and an LSO Facility Representative. Efforts to fill these essential positions have been impeded by delays in Headquarter's approval because of concerns about reduction in force. In addition, OAK, as with most DOE organizations, is facing a need to reduce overall staffing levels. It is important that OAK carefully manage future "early out" programs to minimize the potential for additional technical shortages in certain technical areas.



OAK Facility Representatives have a good understanding of their assigned facilities.

The OAK Facility Representatives assigned to LLNL demonstrate a comprehensive knowledge of their assigned facilities, including hazards, programs, systems, and operations at those facilities. A high degree of teamwork was evident among the Facility Representatives and was recognized in the "120-Day Study." In addition, the OAK operations teams are having a positive impact by enhancing communications and teamwork between Facility Representatives, subject matter experts, and OAK program personnel.

The Facility Representative Qualification Program is well-defined, documented, and implemented, and the Facility Representative Training Program meets the qualification standards defined by the DOE Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 93-3, *Improving DOE Technical Capability in Defense Nuclear Facility Programs*, and DOE Order 360.1, *Training*. Five of the eight Facility Representatives have completed all phases of the qualification program



Maintenance of a laser target chamber

at the time of this review. The others are on schedule to complete their qualification programs and are working under the supervision of the senior Facility Representatives. Evaluations, which include oral boards and written examinations, are performed to ensure that trainees are technically competent and proficient in the facilities. OAK and LSO managers, including the OAK Office Manager, demonstrate their commitment and support to the Facility Representative Program through their participation on the oral boards.



The OAK Technical Qualification Program has made significant progress.

The OAK Technical Qualification Program has made significant progress toward meeting the schedule associated with the Defense Nuclear Facilities Safety Board Recommendation 93-3 Implementation Plan. OAK has developed the appropriate qualification standards for each affected job position and plans to certify all technical positions by May 1999. Recognizing the value of the Technical Qualification Program, the OAK Office Manager is considering extending the Technical Qualification Program to all OAK technical personnel. For OAK to meet the May 1999 milestone for certifying technical and management qualifications, additional attention is needed to strengthen efforts to identify and complete individual learning activities and document and track competencies obtained through training.

LLNL

LLNL has many highly educated, experienced, and technically qualified management and staff. Competence levels at LLNL benefit from the experience base of its managers and ES&H professionals, many of whom have worked at LLNL for a considerable time and thus are familiar with the facilities, equipment, hazards, and operations.

Staffing levels and skill mix are managed by each Directorate. As needed, the Directorates can obtain additional technical or ES&H resources through the matrix management approach, which enables a Directorate to “purchase” specific technical or ES&H competencies from other Directorates to accomplish a project or program activity. This approach promotes efficient use of resources to meet changing activity levels and needs within individual programs and facilities. Managers and staff are encouraged to continue developing competencies through a number of training and educational initiatives supported by LLNL management. LLNL provides funding and opportunities for employees to obtain advanced college degrees and professional certifications (for example, some LLNL staff have become Certified Health Physicists by completing courses and written and oral exams).



LLNL has effectively used matrix management and ES&H teams to provide ES&H and technical skills where needed.

As discussed in the Clear Roles and Responsibilities section, the LLNL matrixed management system is mature and effective and uses ES&H Teams to support line management and to perform many ES&H functions. Four continuous ES&H Teams have been established that can be tailored in experience and expertise to meet individual program needs. The ES&H technicians assigned to the teams have responsibilities that include radiation protection and industrial safety and hygiene. Although the radiation protection training and qualification for ES&H technicians has been comprehensive and based on a job-task analysis, the industrial safety and hygiene training has been informal and the scope and effectiveness need to be improved. Additional attention is needed to ensure

that ES&H technicians are competent to fulfill their industrial safety and industrial hygiene responsibilities and to develop and implement ES&H training in support of ISM.

Requirements are not defined for selecting, training, and developing the capabilities of facility managers, assurance managers, and building coordinators. The lack of such requirements is contributing to weaknesses in implementing work controls, monitoring performance, and providing feedback to ensure that corrective actions are taken when deficiencies are identified.

In response to the DOE-mandated staff reductions, LLNL has instituted several voluntary separations and buyout packages over the past few years. Though successful in reducing overall staffing levels, these voluntary reductions resulted in deficiencies occurring in specific skill areas, including criticality safety and emergency management. In response, LLNL management implemented additional control measures to limit the impact on certain job categories by using focused buyouts where appropriate.



LLNL has a decentralized training program, which can promote line management involvement; however, a number of issues need to be addressed to ensure training programs meet their objectives.

LLNL has a decentralized training organization. Training resources are assigned to specific Directorates, programs, and facilities or are provided through the matrix management approach on an as-needed basis. LLNL management believes that the decentralized approach promotes line management ownership and support of training while also ensuring that both technical and ES&H training programs meet their specific needs. LLNL's training organization currently has approximately 13 separate teaching organizations, each of which is managed by a facility or a department. These teaching organizations, which are very small, typically borrow subject matter experts from their individual departments to develop lesson plans, teach (classroom and on-the-job training), develop and administer examinations, develop training materials, and conduct job performance evaluations. While this decentralized and matrixed approach to training promotes line

ownership and support, the following are training issues at LLNL that warrant increased management attention to ensure that training programs meet their objectives:

- Multiple demands on subject matter experts has sometimes resulted in inequitable distribution of resources and delays in implementation of training development and implementation.
- Initial training courses are frequently reused as annual or semi-annual retraining, which can result in a loss of interest and missed opportunities to increase competencies during retraining.
- Some subject matter experts and training personnel are not competent in training and training development techniques.
- Line managers have considerable discretion on funding and resources committed to training programs. Some line managers, because of their lack of training experience, do not appreciate the need to support the development of performance-based training for some technical and ES&H activities.
- LLNL is increasing the use of Web-based training, which can be effective, inexpensive, and easily accessible. However, there is a tendency to use Web-based training in instances where other training methods, such as classroom or hands-on training, would be far more effective (such as training on the use of fire extinguishers).

LLNL's recent implementation of a centralized training and qualification computer data base is designed to significantly assist managers and supervisors in identifying worker qualifications, requirements, and training requests, and in scheduling training and retraining. Using this system, managers and supervisors can readily view a variety of reports on the status of worker training, retraining schedules, no shows, and any deficiencies in meeting ES&H training requirements. This tool also enables managers and supervisors to easily determine whether individuals selected for a position are currently trained and qualified. This capability helps to address worker training and qualifications deficiencies that have contributed to past LLNL events and accidents.

Summary

OAK, LSO, and LLNL senior management are displaying a high level of commitment to maintaining and strengthening technical and ES&H competencies at LLNL. This support is demonstrated through the active involvement of senior managers in training and qualification programs, the support for continuing training and graduate degree programs, and various ongoing initiatives. With the exception of a few specific technical staffing issues in OAK, LSO, and LLNL that need to be addressed, both DOE and LLNL are staffed with competent personnel who are capable of fulfilling technical and ES&H responsibilities. Additional LLNL management attention is warranted to ensure that efforts to achieve line management ownership and support of technical and ES&H training through decentralization of the training program are effective and address the identified issues. The understanding, acceptance, and implementation of ISM could also be significantly enhanced by educating LLNL managers, supervisors, and workers on the objectives, principles, and approaches of ISM (the LLNL Engineering Directorate has already implemented such training).

Identification of Standards and Requirements

GUIDING PRINCIPLE #5: Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards shall be established that, if properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences.

An effective safety management system must include processes to identify, communicate, execute, and monitor all applicable DOE requirements and federal, state, and local regulations. Establishing responsibility for managing requirements includes translation of requirements into policies, programs, and procedures, and the development of processes to tailor these requirements to specific work activities.

Headquarters program offices, including DP and EM, provide expectations to the field on requirements established by Headquarters. Implementation of these requirements is generally delegated to DOE field management such as OAK.

OAK has the responsibility to review requirements, determine their applicability to LLNL activities and hazards, ensure that LLNL is contractually accountable for implementing requirements, and perform oversight to verify that LLNL is effectively meeting requirements.

DOE and External Requirements



OAK, UC, and LLNL have effective processes for identifying and transmitting applicable requirements.

There is a structured, documented, and effective process for the identification of applicable DOE requirements from OAK to LLNL through UC, the contract holder. The OAK Laboratory Contracts Management Division serves as the focal point for DOE requirements management activities, which include identification, applicability review, and ultimate transmittal of new or revised requirements to UC. OAK plays a key role in the identification of both internal requirements (DOE policies, orders, rules, and notices) and external requirements (including requirements promulgated by external organizations such as other federal agencies, the state of California, and local regulatory agencies).

The OAK Contracting Officer has unilateral authority to add, modify, or delete DOE directives from the prime contract with UC. OAK has made improvements in requirements and contract management. For example:

- The allowable period for LLNL to review requirements for applicability has been shortened from 60 to 30 days.
- Applicability reviews are conducted by the OAK ES&H Division subject matter experts before new or revised requirements are transmitted to UC.
- Provisions for implementing ISM and related performance measures were recently incorporated into the UC contract.



The new DOE/UC contract includes provisions for using Work Smart standards.

DOE directives applicable to LLNL are identified in Appendix G of the recently renewed DOE/UC contract. DOE rules are an exception, because they have the full effect of federal law and are applicable to LLNL activities and hazards when they are promulgated. In accordance with the new contract, OAK and LLNL are jointly developing Work Smart standards. The set of Work Smart standards will be incorporated into Appendix G of the contract. Work Smart standards include the systematic identification and evaluation of the set of internal and external standards and requirements that apply to specific activities and related hazards and can enhance safety when implemented. LLNL has been proactive and aggressive in its transition to the Work Smart standards. OAK (including LSO) management and staff have been actively involved in and highly supportive of LLNL's transition to Work Smart standards. OAK and LLNL expect that the Work Smart standards approach will significantly increase the understanding, acceptance, and effective implementation of essential requirements. Once OAK and LLNL determine the applicable sets of requirements for their activities and hazards, expected by December 1997, implementation plans need to be developed and submitted to OAK for review and approval.

During the period of development and implementation of Work Smart standards, OAK is selectively transmitting new and revised requirements to UC, although there are no formal criteria for the selection process. In the interim period, some requirements have been instituted as combinations of the old and new series DOE Orders. For example, OAK decided not to transmit DOE Order 440.1, *Worker Protection*, issued in September 1995, to UC for implementation or potential incorporation into Work Smart standards. However, existing requirements for worker protection remain in effect until the new Work Smart standards are adopted.

External requirements applicable to LLNL are also identified in Appendix C of the UC contract. OAK's processes to identify and transmit external requirements are generally effective but are less structured than those used for the internal requirements listed in Appendix G. OAK has the primary role in the identification and transmittal of emerging applicable environmental requirements. In the absence of systematic and continuous monitoring for emerging environmental requirements, OAK and

LLNL rely primarily on project reviews to identify environment requirements. Although no significant omission of new or revised environmental requirements was identified at LLNL, a more structured approach would ensure reliable identification of environmental and other external requirements applicable to existing projects and thereby eliminate a potential vulnerability. The UC and LLNL contracting process for identifying DOE and external requirements applicable to the LLNL are well integrated with those of OAK.

LLNL Requirements Management



LLNL does not adequately tailor requirements to the hazards associated with the activity.

The requirements from Contract Appendices C (external) and G (internal) are translated by LLNL into implementing documents, including the Health and Safety Manual, the Environmental Compliance Manual, and Quality Assurance documents. The LLNL ES&H program provides an overview of these key policy and requirements documents. Institutional requirements are subsequently translated by LLNL into implementing level documents such as facility safety procedures, operational safety procedures, and discipline action plans. A hierarchy of these requirements documents is represented by Figure 6. LLNL has no formal processes or procedures for translating requirements into manuals and procedures and does not adequately tailor requirements to ensure appropriate controls for specific work activities. As indicated by Figure 6, LLNL has a wide variety of mechanisms that have evolved to implement policies and requirements at the activity level. However, these numerous mechanisms are not integrated into a common system, do not adequately address all activities, and are not consistent with each other. These factors contribute to the work control deficiencies discussed in the Hazards Analysis, Work Planning, Hazards Control and Operations Authorization section.

The LLNL Health and Safety Manual and the Environmental Compliance Manual are generally effective in capturing the applicable DOE and external requirements contained in the UC contract. These manuals are the primary LLNL guidance documents for ES&H requirements. The following

**LAWS, REGULATIONS, STANDARDS, DIRECTIVES
FEDERAL, STATE, LOCAL, DOE, INDUSTRY**

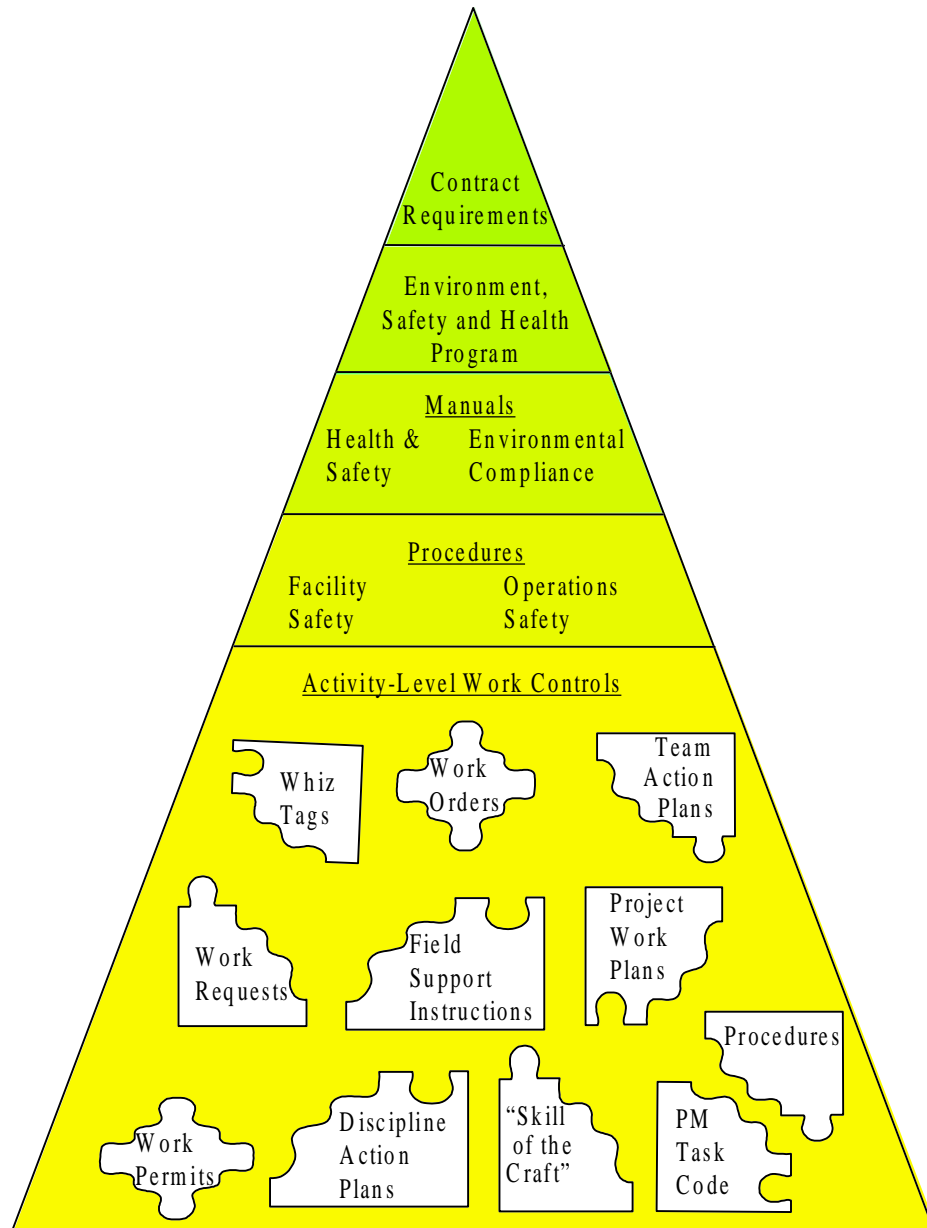


Figure 6. LLLNL's Hierarchy of Requirements, Policies, and Procedures

are instances in which specific requirements were not effectively captured either within the Health and Safety Manual or subordinate documents such as facility safety procedures, operational safety procedures, and emergency management documents:

- The Health and Safety Manual, Supplement 2.19, addresses procedures but does not provide the required policy on procedure use and compliance.
- The Health and Safety Manual Chapter on Safety Analysis did not reference DOE Order 5480.22, *Technical Safety Requirements*, or DOE Order 5480.23, *Nuclear Safety Analysis Reports*. Supplements 2.22 and 2.23 have recently been issued to reference these orders, but these supplements indicate that specific implementing guidance and direction has not yet been generated.
- LLNL emergency management documents did not address the sitewide safety requirements for the use of Freon 123, a replacement coolant used in LLNL air conditioning units, which involves potentially significant hazards to workers if handled improperly.



The incorporation of requirements into subcontracts needs continued attention.

Translation of ES&H requirements into smaller subcontracts needs continued management attention. LLNL management had recognized, based on a number of work-related events, a need to strengthen subcontractor safety management. Large construction contracts are now subject to pre-qualification based on the subcontractor's safety record. These contracts also incorporate ES&H plans commensurate with the level of risks involved in the project. The National Ignition Facility construction project utilizes a comprehensive ES&H plan and an ES&H Team to ensure ES&H requirements are effectively implemented. The Office of Procurement is currently expanding this approach to smaller subcontracts. The Safety Management Evaluation team observed two instances in which inadequate fall protection was

employed, both of which involved subcontracted projects. In these instances, contractual ES&H requirements were inadequate, and ES&H line management oversight was not effective. Both cases involved support service subcontracts that were not issued by Plant Engineering or as part of program or project work. Subcontractor safety management and subcontracting improvements made for large contracts have not yet been implemented for some LLNL subcontracts. This situation warrants additional LLNL management attention.

Summary

The requirements management processes for OAK, UC, and LLNL have been effectively integrated and provide a generally effective system for the identification, transmittal, and implementation of DOE and external requirements. Additional management attention is warranted to establish a formal transition plan for implementing Work Smart standards. LLNL needs to strengthen their flowdown of requirements (such as the processes for tailoring DOE or external requirements to the hazards and operations at specific facilities and work activities) to ensure that all requirements are captured in institutional documents and support service subcontracts. LLNL has not been effective in tailoring requirements to the work activity level.

Hazard Analysis, Work Planning, Hazard Controls, and Operations Authorization

GUIDING PRINCIPLES #6 and #7: Administrative and engineering controls to prevent and mitigate hazards shall be tailored to the work being performed and associated hazards. The conditions and requirements to be satisfied for operations to be initiated and conducted shall be clearly established and agreed upon.

OAK, LLNL, and UC senior management are committed to ISM as a means of strengthening safety management at LLNL and are aggressively pursuing full implementation within the next year. However, the absence of an effective work planning and control process that encompasses all site activities and effectively implements the five core functions of safety management is a significant barrier to the successful implementation of ISM at LLNL.

Institutional Level Hazard Analysis and Control



LLNL ES&H manuals provide overall expectations but do not ensure consistent and comprehensive implementation at the facility level.

The successful implementation of ISM is based on the flowdown of strong institutional hazard control mechanisms to the facility and activity levels. The Health and Safety and Environmental Compliance Manuals provide overall expectations and guidance for integrating ES&H into Laboratory activities and encompass a wide range of ES&H programs. While providing a good overall description of expectations with regard to hazard identification and control, these manuals do not promote consistent and comprehensive implementation at the facility and activity levels. Correspondingly, the ES&H programs reviewed on this Safety Management Evaluation vary widely in the degree of formality, rigor, completeness, and effectiveness in establishing and implementing institutional hazard control processes.



The Area 514 Hazardous Waste Treatment Complex

An example of the weaknesses in upper-tier hazard control processes was the Emergency Management Program, the institutional program for preparing for and responding to operational emergencies at LLNL. Although the Laboratory has significantly reduced the types and quantities of hazardous materials on site since 1980, the hazard

analyses processes that support the Emergency Management Program have significant weaknesses. Quantitative analyses, such as hazard surveys and hazard assessments that are needed to determine sitewide responses to operational emergencies, are not adequate. LLNL has not established formal work plans, formal methodologies, or procedures to govern the conduct of these analyses. Sitewide processes are not formally linked to facility source documents such as Safety Analysis Reports and Process Hazards Analyses. The Emergency Plan Implementing Procedures are outdated and inconsistent with existing requirements and site conditions, some procedures are not sufficiently detailed to ensure that emergency managers can perform time-sensitive responses to off-normal events, and some have not been reviewed and approved by DOE as required.

Facility and Activity Level Hazard Analysis and Control

This Safety Management Evaluation focused on a cross-section of LLNL facilities, including higher hazard classified facilities such as the Plutonium Facility (Building 332) and the Site 300 Explosives Testing Site and several low-hazard facilities such as the Chemistry Laboratory (Building 222), the Machine Shop (Building 321, which includes the Building 322 Plating Shop), and the Waste Management Facilities (Area 514). Construction safety at the National Ignition Facility and support services across the site were also evaluated. These facilities represent a wide range of hazards, including nuclear criticality safety, radiological, chemical, explosives, and industrial hazards.

A system of formal and current hazard analyses that includes both nuclear and non-nuclear facilities is a key element of safety management. Depending on the type of facility and associated hazards, LLNL uses a variety of approaches to establish and document facility-level hazards analyses and control mechanisms. Facility-level processes include:

- Safety Analysis Reports
- Preliminary Hazards Analyses
- Technical Safety Requirements
- Unreviewed Safety Question Determinations
- Safety Question Reviews
- Facility Safety Procedures
- Operational Safety Procedures.



The 612 Area, radioactive and mixed hazardous waste receipt and storage



LLNL has made progress in upgrading Safety Analysis Reports.

LLNL has made progress in revising and upgrading LLNL Safety Analysis Reports and the supporting Technical Safety Requirements to meet the requirements in DOE Order 5480.23, *Nuclear Safety Analysis Reports*, and DOE Order 5480.22, *Technical Safety Requirements*. LLNL has developed the required implementation plans, and they have been reviewed and approved by DOE. OAK's team-based process for approving Safety Analysis Reports was noted as a positive initiative in the "120-Day Study" (a report developed by an independent consulting firm at the direction of Congress for the Assistant Secretary for DP that analyzed the management and organization of the DOE nuclear weapons program). The Building 332 Plutonium Facility Safety Analysis Report has recently been upgraded to meet DOE Order 5480.23 requirements, is current, was developed in accordance with Order requirements, and has been approved by OAK. However, OAK and LLNL recognize that the current hazards analysis for the Hazardous Waste Management Facility Safety Analysis Report, approved in 1996, requires significant revision. The supporting Hazardous Waste Management Facility Technical Safety Requirements have yet to be approved and implemented.



There were weaknesses in the implementation of unreviewed safety questions processes.

Unreviewed Safety Question Determinations (nuclear facilities) and Safety Question Reviews (non-nuclear facilities) are used to assure that proposed facility activities or modifications are encompassed by the existing Safety Analysis Report and hazard analysis. The LLNL Health and Safety Manual provides specific guidance on how to perform these Unreviewed Safety Question Determinations and Safety Question Reviews, and in most cases, they appear to be conducted effectively. However, the following weaknesses in the implementation of the Unreviewed Safety Question process were identified at several facilities:

- Operational safety procedures and facility conditions related to the filter-shredding occurrence in Building 513 and subsequent recovery efforts did not receive Unreviewed Safety Question screenings as required by the DOE Order and LLNL guidance.
- An Unreviewed Safety Question screening for replacement electrical breakers in Building 332 did not contain or reference appropriate technical justification for the breakers or properly identify and address potential impacts on the authorization basis for safety systems taken out of service during repairs.



LLNL procedures do not contain adequate detail to reliably identify and control hazards.

The LLNL Health and Safety Manual reflects most DOE requirements and LLNL policies for identifying and controlling ES&H hazards at the facility level. The requirements of the LLNL Health and Safety Manual are further identified through facility safety procedures. These facility safety procedures provide a baseline for identifying facility-specific hazards and hazard control mechanisms. They do not, however, contain an adequate level of detail to identify and control the hazards associated with more specific work activities. Similarly, operational safety procedures, used to identify and control hazards associated with new operations not described in facility safety procedures, often do not contain sufficient detail and are not an effective substitute for detailed operating manuals, procedures, and work instructions and permits.

LLNL continues to experience events, accidents, and near misses related to the inadequate control of work activities and hazards. Over the years, various work control processes have evolved, including:

- Project Work Plans
- Preventive Maintenance Task Codes
- Job Orders
- Work Permits
- Work Requests
- Whiz Tags
- ES&H Integration Worksheets.



Work controls processes are inconsistent and vary in effectiveness.

However, most of these efforts have been developed and implemented on a facility-by-facility or program-by-program basis, rather than from a sitewide, integrated approach. This has resulted in variations in the level of effectiveness and inconsistent processes between facilities and programs for similar hazards. LLNL has not established sitewide institutional policies or procedures that define these various mechanisms, their use, or the linkage between the associated analyses and controls in the Health and Safety Manual, facility safety procedures, and operational safety procedures. Some programmatic activities, such as the project in Building 332 supporting sub-critical nuclear testing in Nevada, are well-analyzed. However, some other activities are not effectively controlled, and mechanisms are not established to consistently ensure that work activities, such as maintenance, temporary modifications, and support service, are controlled effectively and appropriately tailored to the hazards.

Observations of work and review of LLNL occurrence reports over the last two years indicate an informal approach to controlling work activities that, in some cases, places excessive reliance on the researcher/worker knowledge and “skill of the craft” to define the scope of work, analyze and control hazards, and work within those controls. Excessive reliance is also often placed on the facility safety procedures and operational safety procedures to control specific work activities and hazards, although these documents do not contain sufficient detail or specificity to effectively serve that purpose.

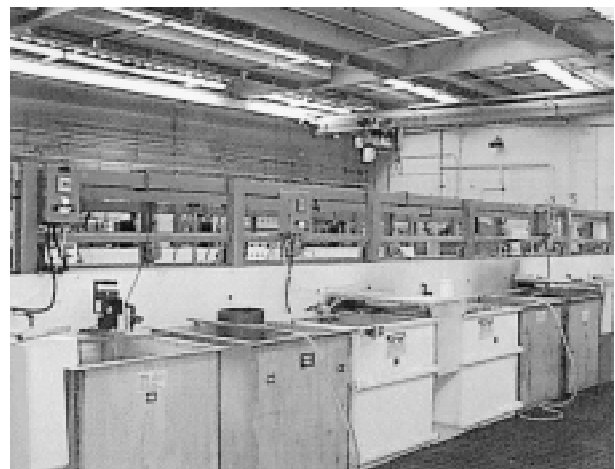
The events and accidents over the recent past and continued instances of ineffective work practices indicate a number of deficiencies in the LLNL work control process, most of which are not identified or corrected in a systematic manner through the occurrence investigation and reporting process. Examples include:

- Inadequate work instruction
- Inadequate hazard analysis and involvement by appropriate safety specialists
- Inadequate hazard controls including permits and personal protective equipment
- Inadequate pre-job briefings or participation
- Starting work without proper authorization
- Exceeding the defined work scope
- No quality assurance involvement or hold points (safety-related work)
- Failure to use or adhere to procedures
- Inadequate on-the-job supervision.



Deficiencies in work control processes contribute to the events at LLNL.

LLNL’s deficiencies in controlling some work activities and associated hazards are clearly demonstrated in problems with criticality mass control limits and in the recent filter-shredder event in the waste management area. On July 2, 1997, the shredding of contaminated high-efficiency particulate air filters by workers in Building 513 resulted in internal radiological contamination of the workers, extensive building contamination, and an unplanned radiological release (less than regulatory limits) for the building (see text box on Page 35).



The Plating Shop

HEPA Filter-Shredder Incident Inadequate Control of Work Results in Internal Contamination of Workers

Background: At some LLNL facilities, high-efficiency particulate air (HEPA) filters are used to remove microscopic hazardous and radioactive particles from glove box and building ventilation systems prior to release to the environment. The Hazardous Waste Management Division uses a large, industrial shredder in Building 513 (a building within the 514 Hazardous Waste Complex) to shred bulky components, such as filters, to reduce the volume of waste. This division recently began shredding minimally contaminated HEPA filters.

Event Description: On July 2, 1997, operators at Building 513 inadvertently shredded a highly contaminated HEPA filter. The HEPA filter had not been properly characterized by the waste generator, and engineering and administrative controls to prevent or mitigate the consequences of accidentally shredding a highly contaminated HEPA filter were not properly implemented by the Hazardous Waste Management Division. The event resulted in internal contamination of workers, extensive building contamination, and a small unplanned release from the building, which was below regulatory limits and which remained on site.

Implications to Safety Management: The event illustrates breakdowns in all five core functional areas of integrated safety management. Some of the specific deficiencies evident from this event include:

- The scope of work for the operation was not well-defined in the Safety Analysis Report and Operational Safety Procedures. The allowable isotopes for shredding were not identified.
- An Unresolved Safety Question determination was not performed, hazards and risks were underestimated, and a technical basis was not developed for the radiological activity limit.
- Requirements/controls for procedures, characterization, monitoring, survey, continuous air monitor operation, and involvement of health physics personnel were inadequate.
- Neither pre-job dry runs, on-the-job training, or authorization of work to begin were documented, and a confirmation of readiness was not performed.
- Numerous violations of Operational Safety Procedures occurred: radiation monitoring was not established, ventilation flow rate was less than required, and the radiological activity and hopper loading limits were exceeded. A reciprocating saw was used inappropriately to cut filters inside the hopper.
- Several judgments of need in response to the accident investigation are general and not focused on causal factors. Management has implemented some interim corrective actions, but these actions do not address fundamental causes of the incident.

Deficiencies in work planning and control were also evident in the 321 complex and more specifically in the Plating Shop, Building 322 (which is part of the 321 complex). Chemical and electrochemical plating processes are conducted in Building 322, which is categorized as a low-hazard facility and thus is not subjected to the same rigor of hazard analysis and ES&H oversight as high-hazard facilities. Deficiencies in application of the five core functions noted during the evaluation are illustrated in Table 1.

These examples reflect the failure to implement existing procedures and the lack of an institutionalized work control process. These are barriers to the LLNL implementation of the five core functions of ISM at the work activity level. To be effective, a work control process must encompass all site work and hazards while also permitting tailoring of the work and hazard controls to the level of hazard involved. An essential component of this process is the integrated screening, analysis, and identification of

Table 1. Inadequate Work Controls at the Plating Shop

Issue: Inadequate Work Controls at the Building 322 Plating Shop – Operations within the Chemical and Electrochemical Processes area (referred to as the Plating Shop) lack sufficient chemical safety, industrial hygiene, and management controls to ensure adequate ISM.

Define Work

- Some Plating Shop Operations Guidebook instructions do not reflect the current tank operations.
- Work instructions, as defined in the Plating Shop Operations Guidebook, lack specificity to clearly define the required operations.

Analyze Hazards

- There are no clear “triggers” for industrial hygiene involvement in evaluating hazards associated with chemical usage or tank exhaust ventilation.
- An industrial hygiene hazard assessment has not been performed on operations in the Plating Shop.
- The level of ES&H involvement in hazard analyses is based more on the facilities hazard categorization than on the risk to workers. The Plating Shop does not receive a level of ES&H involvement that is consistent with the hazards.

Develop/Implement Controls

- Plating Shop employees have not received training on all hazards specified in the Health and Safety Manual for their work areas.
- The Facility Safety Procedure erroneously states that the Laboratory Fire Department carries an antidote for cyanide poisoning on its ambulance.
- The first aid procedures posted in the area where cyanide-containing compounds are used were neither current nor adequate.
- Personnel Protective Equipment requirements are too generic, do not reflect the variations prescribed by Material Safety Data Sheets, and are not supported by an industrial hygiene hazard assessment.
- Actions to be taken to avoid and respond to mishaps, including review of potential accident scenarios with workers, are not included in individual Plating Shop Operating Guidebook instructions.
- The Emergency Shutdown Procedure has too many actions to allow completion in a timely manner.

Perform Work

- The local ventilation for three chemical tanks was inadequate.
- The ventilation hood sash in Room 100 is not routinely placed to ensure adequate flow.
- Several of the ventilation flow rates and chemical tank contents were inconsistent with the actual tank contents.
- Some chemical tanks were either mislabeled or inconsistently labeled.
- Chemical storage recommendations in the Material Safety Data Sheets are not always rigorously followed.

Feedback and Improvement

- Several corrective actions associated with the caustic spill in the Building 322 Plating Shop have not been adequately implemented.
- It is not evident that the “lessons learned” bulletins on chemical mixing issued during the past two years have been captured at the work activity level.

appropriate controls for work and related hazards by appropriately trained and experienced personnel, including work planners, supervisors, ES&H Teams or safety professionals (such as radiation protection or industrial safety/hygiene specialists), and personnel performing the work. The design of this LLNL work control process should actively involve workers and all facilities to facilitate sitewide understanding, acceptance, and effective sitewide implementation.

Operations Authorization

DOE has the ultimate responsibility for ensuring that all operations performed at DOE facilities are reviewed and authorized at a level commensurate with the hazards. DOE must also ensure that LLNL establishes work authorization processes for both facility and activity level operations. All work activities, including maintenance and modifications,



A test of a gas gun at Site 300

should be subject to authorization based on appropriate review of the preparation and readiness to perform work safely. These reviews must be based on the appropriate hazard analysis and the establishment of controls tailored to these hazards.

LLNL has developed and OAK has approved an Authorization Agreement to address facility operations authorization for the Plutonium Facility (Building 332). The Authorization Agreement is an example of a protocol that can be used to meet the integrated safety requirements for operations authorization defined in DOE Policy 450.4, *Safety Management System*. While the policy was issued in October 1996, DOE Headquarters has not provided formal, detailed guidance on what constitutes an authorization agreement. LLNL was proactive in the development of an Authorization Agreement for Building 332. The Safety Management Evaluation team's review of this agreement indicates a need for more formality and specificity. Issuance of formal guidance from DOE Headquarters would provide additional assurance that the intent of DOE Policy 450.4 is being met.

Authorization agreements are not required for other facilities at LLNL. Instead, the Safety Analysis Report/Safety Evaluation Report approval and operations readiness review processes are utilized by DOE for other nuclear facilities as appropriate.



Processes for ensuring that all work is properly authorized are not consistently effective.

Work conducted within a facility (including nuclear and non-nuclear operations) is generally authorized by a facility safety procedure or operational

safety procedures. There is no effective system to fully integrate mechanisms at the facility level to ensure that all work at the activity level, including non-programmatic work such as maintenance and minor modification, has been analyzed, controls have been established, and work has been authorized commensurate with the hazards prior to initiation. The Safety Management Evaluation team observed and identified some work activities that had not been appropriately authorized, including Building 332 maintenance activities and Building 222 project work plans.

Summary

OAK and LLNL have been reasonably successful in the development and implementation of appropriate hazard analysis, hazard controls, and operations authorization at the institutional level. Senior management within OAK, LLNL, and UC have embraced ISM and are committed to improving safety performance. Implementation of the five core functions of ISM at the work activity level, where the “rubber meets the road,” cannot be successful in the absence of an effective LLNL sitewide work planning and control process that envelops all site activities and associated hazards and a change in the site culture.

Performance Evaluation and Feedback

Performance evaluation and feedback are essential elements to provide DOE and its contractors with timely and informative feedback on ES&H performance, to identify adverse performance trends or issues, and to facilitate continuous improvement to performance.

In the past year, DOE, OAK, LLNL, and UC have jointly worked to strengthen their ability to assess, monitor, and continuously improve LLNL ES&H performance. Through this partnership, there have been a number of significant actions designed to improve performance evaluation and feedback methods, including continual refining of the performance-based contract, developing and monitoring contract performance measures, and increasing DOE oversight and LLNL self-assessment activities. Despite the recent enhancement of these performance evaluation and feedback mechanisms, LLNL's safety performance has not notably

improved, as evidenced by the events and accidents that continue to occur. Both OAK and LLNL senior management acknowledge a need to change the safety culture. However, as discussed throughout this section, more effective and efficient use of the recently developed performance evaluation and feedback mechanisms could contribute significantly to improving ES&H performance, changing the safety culture, and promoting understanding and acceptance of ISM at every level of the organization.

DOE Line Management

The DOE Headquarters program offices, in accordance with DOE policy and strategic initiatives, have delegated most direct oversight responsibility for ES&H performance to field management. Correspondingly, most of the former program office assessment organizations have been disbanded.



OAK is implementing new initiatives to strengthen their processes for monitoring and assessing ES&H performance at LLNL.

Many of the documents delineating OAK and LSO policy, roles, responsibilities, and processes for monitoring and assessing LLNL ES&H performance are relatively new. In 1995, OAK began to perform formal annual assessments of LLNL ES&H performance in accordance with direction from Headquarters. According to this direction, DOE established parameters for operation office onsite evaluations, including limiting onsite evaluations to one two-week assessment per year (additional onsite assessments were only to be conducted “for cause”). Two “for cause” appraisals of LLNL were performed by OAK in 1996. Also, for 1996 and 1997, OAK’s annual assessments were revised to focus primarily on the effectiveness of LLNL self-assessment processes. Given the weaknesses in the LLNL self-assessment program detailed in this report and the acknowledged management concerns with LLNL safety performance, continued and additional OAK/LSO monitoring and appraisal beyond day-to-day operational awareness and the annual two-week appraisal are warranted.

The OAK ES&H FRAM assigns responsibilities for developing an annual Assessment Management Plan for LLNL, which describes the annual

assessment activities by DOE. LSO is responsible for planning and conducting annual assessments, coordinating other assessment activities, and leading ES&H contract performance measures. OAK program divisions and LSO are responsible for the implementation of the Assessments Management Plan within their respective facilities. Other recently issued documents associated with OAK oversight and assessments include Overview of OAK’s ES&H Programs, LLNL ES&H Appraisal Protocols, and a Memorandum of Agreement Governing Facility Representative Responsibilities.

OAK recently began implementation of the Oakland Information Management System, which is a single system designed to capture, track to closure, and trend data for operational awareness and assessment activities. While the system was too new to evaluate during this assessment, it has the potential to significantly strengthen OAK’s ability to monitor performance, track corrective actions, and identify adverse trends and performance issues at LLNL.



OAK’s primary oversight tool is operational awareness activities.

The primary OAK ES&H oversight tool at LLNL is operational awareness activities performed by OAK/LSO managers, staff, and Facility Representatives. OAK/LSO management and staff perform periodic walk-throughs of facilities. Facility Representatives assigned to the LLNL site conduct surveillances of conditions and performance within assigned nuclear and high-hazard facilities and, to a much lesser extent, in low-hazard facilities. The LLNL Facility Representatives are knowledgeable of the facilities and programs and actively engaged in monitoring ES&H performance. However, most ESHD subject matter experts are not currently being used effectively to support operational awareness activities. Deficiencies in the Operational Awareness Program include insufficient integration of ESHD subject matter experts with surveillance activities and inadequate focus on work activities and the implementation of the five core functions of ISM. Increased use of formal mechanisms to transmit operational awareness results to LLNL is warranted.

Until very recently, OAK had not performed self-assessments to critically evaluate their own performance in managing and assessing the

Laboratory. An OAK self-assessment was conducted in June 1997 in preparation for this Safety Management Evaluation. The OAK self-assessment findings resulted in many of the recent improvement initiatives and programs identified throughout this Safety Management Evaluation report. OAK recently established a policy to perform an annual self-assessment.

Contractual Performance Measures



The new contract has performance measures linked to ISM.

OAK has used contract performance measures to monitor LLNL ES&H performance since 1992. These performance measures and objectives are negotiated each year by OAK, LLNL, and UC and are described in Appendix F of the UC contract. OAK and LLNL hold quarterly performance status meetings, and LLNL prepares an annual self-assessment report on performance that is subject to validation by DOE and UC. LSO issues a rating of performance based on DOE's validation of the LLNL ES&H self-assessment. These integrated performance monitoring, assessment, and rating activities by DOE, LLNL, and UC demonstrate a commitment by senior management to achieve continuous improvement in ES&H performance at LLNL. This commitment was further demonstrated during the period of this evaluation when a new UC contract went into effect. The new contract aligns the performance objectives and criteria with the DOE Integrated Safety Management Policy (DOE Policy 450.4) and includes a set of five process measures to evaluate LLNL implementation of ISM, and nine outcome measures that evaluate numerical performance, such as personal injuries.

Historically, contractual performance measures have not identified systemic deficiencies related to ES&H performance. Some of the new performance criteria in the 1998 contract are vague, and some of the related gradients² are less than challenging. For

example, one of the criteria addresses hazards analysis; the gradient for this criteria indicates that OAK and LLNL have agreed that LLNL "meets expectations" if 70 percent of the hazards are correctly identified and effective controls are in place, and that LLNL "exceeds expectations" if 80 percent of the hazards are correctly identified and effective controls are in place. The implication is that LLNL can fail to effectively identify and control up to 30 percent of the hazards and still meet expectations. Specific and challenging performance measures establish credibility for, and enhance the effectiveness of, these management evaluations in driving improvement in ES&H performance.

The recent contractual evaluations have been based primarily on the performance criteria, which are not comprehensive indicators of performance. In January 1997, LLNL was rated as "excellent exceeds expectations" in ES&H. This rating reflects LLNL's ES&H performance in 1996 as judged against the performance measures negotiated in 1995. This rating was based on a number of factors, including environmental performance, which OAK judged to have significantly improved. During this rating period, however, LLNL continued to experience a number of events and occurrences and had not adequately addressed some of the deficiencies identified in previous assessments (including the 1992 Progress Assessment) that identified weaknesses in work planning and procedure compliance. Since receiving this rating, both OAK and LLNL management have acknowledged a need to improve safety performance and safety culture, and LLNL experienced a significant event (involving the filter-shredder), a voluntary stand-down for criticality safety concerns, and receipt of a letter from the OAK Manager expressing concerns with ES&H performance. The practice of relying exclusively on performance measures for performance scoring, and not factoring in other performance indicators, such as events, near misses, and concerns identified by assessment programs, needs to be re-evaluated.

University of California and LLNL

UC is actively involved in monitoring the performance of LLNL, including ES&H performance. UC senior management actively monitors and evaluates the Appendix F performance measures and performs trending with performance charts. To maintain awareness of issues and ES&H

² "Gradients" refers to the OAK/UC/LLNL system for assigning ratings to each performance measure, which is based on assigning one of the possible ratings (e.g., exceeds expectations, meets expectations, or below expectations) based on performance with respect to measurable criteria.

performance, UC has frequent meetings and telephone contact with LLNL and OAK management; reviews management, operational, and occurrence reports; and participates in crosscutting initiatives such as Work Smart standards. UC is working through the “Partnership for Performance Agreement” with OAK and LLNL to achieve continuous improvement in LLNL safety management and performance.



LLNL has a multi-faceted assessment program.

The policies and processes that constitute the LLNL Performance Assessment Program are appropriate and consistent with the intent of the DOE Safety Management Policy (DOE Policy 450.4). The LLNL self-assessment program is delineated in the Health and Safety Manual and in a January 1997 program description document. The program consists of a wide range of formal and informal reviews, inspections, assessments, and management walk-throughs. Directorate and Facility Assurance Managers and the Assurance Review Office provide the organizational framework for the performance assessment program. LLNL self-assessment activities are being performed at the facility, department, division, and Directorate levels.



Handling of hazardous waste

The Assurance Review Office reports directly to the Deputy Director for Operations and is

responsible for conducting independent assessments of LLNL performance at an institutional level. The Deputy Director for Operations also sponsors a triennial independent assessment of LLNL management performance conducted by external contractors. Annual self-assessments performed by each LLNL Directorate collectively form the basis for the annual report to UC on performance against the UC contract Appendix F performance measures. A computer tracking system (DefTrack) is used by line organizations to track most deficiencies identified by independent and self-assessment to closure. LLNL performs independent verification and documentation to ensure that corrective actions for many assessment issues entered into DefTrack are completed.



Assessment activities are not effectively resolving systemic weaknesses that contribute to findings and issues.

Although the framework and processes for the LLNL independent assessment and self-assessment programs are in place, these programs are not fully effective. One key weakness is that corrective actions have not always been timely or effective in identifying and resolving the management and programmatic weaknesses that contribute to assessment findings and issues. Many of the issues identified by this evaluation, such as informal work controls, procedure noncompliances, and the gaps in the translation of DOE and LLNL requirements and policies into working level documents, were identified in a DOE Headquarters EH 1992 Progress Assessment but have not been systematically and effectively addressed. Similarly, some deficiencies in Emergency Management identified during this evaluation were previously documented in a 1994 external assessment but remain uncorrected.



LLNL assessments are not sufficiently focusing on performance.

Other weaknesses in process and implementation are significantly impeding the effective application of the performance evaluation and feedback elements of the LLNL ISM program.

The ability of the LLNL assessment programs to improve ES&H performance, decrease events and accidents, change the LLNL safety culture, and facilitate implementation of ISM could be significantly increased by strengthening the following areas:

- LLNL assessments focus on material conditions and compliance but do not adequately focus on performance. Assessment activities should focus more on the adequacy of ES&H programs, work activities, and the implementation of the five core functions of ISM, including direct feedback and coaching where appropriate.
- Corrective actions for identified deficiencies often do not extend beyond correction of specific citations of noncompliance. Assessment and inspection findings and operational occurrences should be analyzed for management and programmatic weaknesses, with a focus on identifying and correcting root causes instead of treating symptoms.
- Many ES&H deficiencies are not captured in tracking systems because they are communicated verbally or are fixed without documentation. Documentation and follow-up for identified deficiencies should be based on significance, rather than on the source or ease of resolution, to ensure the ability to conduct trending and identify generic performance issues and weaknesses.
- There was little evidence of worker feedback following work activities. LLNL management should emphasize the “self” in self-assessments by having workers participate in evaluating their

own performance, increasing their understanding of ES&H performance expectations, and helping to develop corrective actions.

- With the exception of a few performance measures and indicators, little analysis and trending of ES&H deficiencies is performed. Increased analyses of assessment results and trends sitewide are needed to identify opportunities for improvement to safety management programs, policies, and controls.

Summary

OAK, UC, and LLNL have established a number of ES&H performance measures (which have been incorporated into the UC contract) and are jointly and actively collecting and evaluating performance information. OAK has an effective Facility Representative Program and new initiatives such as the Operational Awareness Program to increase oversight and presence in LLNL facilities. Significantly increased participation in oversight activities by OAK subject matter experts is needed in many functional areas. Although not fully effective, LLNL has established independent assessments and self-assessment activities to evaluate ES&H performance on a continuing basis. Improvements to the LLNL assessment program in areas such as focusing on human performance, consistent capture of deficiencies, identification and correction of management and programmatic weaknesses, and improved analysis of sitewide assessment issues, are needed to improve the effectiveness and contribution of the programs to LLNL ES&H performance.